Random Sampling

NAME _____ DATE _____

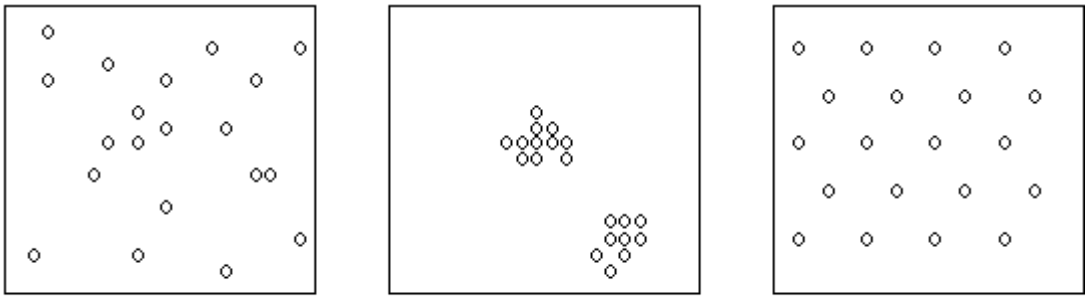
To study the dynamics of a population, or how the distribution of the members of a population is influenced by a biotic or an abiotic factor, it is necessary to estimate the population size. In other words, it will be necessary to count the number of individuals in a population. Such counting is usually carried out by taking samples.

One of the most fundamental problems faced by community and population ecologists is that of measuring population sizes and distributions. The data is important for comparing differences between communities and species.

In most cases it is either difficult or simply not possible to count all of the individuals in an area. The only way around this problem is to estimate population size using some form of sampling technique. There are numerous types of sampling techniques. Some are designed for specific types of organisms (e.g. plants vs. mobile animals). As well there are numerous ways of arriving at estimates from each sampling technique. All of these procedures have advantages and disadvantages. In general, the accuracy of an estimate depends on 1) the number of samples taken, 2) the method of collecting the samples, 3) the proportion of the total population sampled.

The object is to collect as many randomly selected samples as possible (so as to increase the proportion of the total population sampled). The accuracy of an estimate increases with the number of samples taken. This is because the number of individuals found in any given sample will vary from the number found in other samples. By collecting numerous samples, the effect of these variations can be averaged out.

The purpose for collecting the samples randomly is to avoid biasing the data. Data can become biased when individuals of some species are sampled more frequently, or less frequently, than expected at random. Such biases can cause the population size to be either over estimated or under estimated, and can lead to erroneous estimates of population size. Populations can also be distributed in various ways through the sampling area.



Ecologists are often interested in the spatial distribution of populations because it provides information about the social behaviour and/or ecological requirements of the species. For example, some plants occur in clumped distributions because they propagate by rhizomes (underground shoots) or because seed dispersal is limited. Clumped distributions in plants may also occur because of slight variations in soil chemistry or moisture content. Many animals exhibit rather uniform distributions because they are territorial (especially birds), expelling all intruders from their

territories. Random distributions are also common, but their precise cause is more difficult to explain.

Random sampling with quadrats

The quadrat method is used primarily in studies of plant populations, or where animals are immobile. The principal assumptions of this technique are that the quadrats are chosen randomly, the organisms do not move from one quadrat to another during the sampling period, and that the samples taken are representative of the population as a whole. It is often conducted by dividing the area into a grid. Each square within the grid is known as a quadrat and represents the sample unit. Quadrats are chosen at random by using a random number generator or a random number table to select coordinates. The number of individuals of the target species is then counted in each of the chosen quadrats.

Materials

-Quadrats - Meter sticks - String

Procedure:

1. Two 10 meter square areas have been laid out for you. Area A and B
2. Using a random number generator, select two numbers between 1 and 10. This is your first coordinate for placing your quadrat. (i.e. 3,4)
3. Position your quadrat at these coordinates (See figure).
4. Identify and count each plant species presented within the quadrat
5. Record your results in Table 1.
6. Repeat Steps 2-5 until you have data for 5 sample areas.
7. Move to Area B
8. Repeat steps 2-5 until you have data for 5 sample areas.
9. Record your results in Table 2.
10. Find the total number of each plant for the 5 segment sample.
11. Add all the grid segments together and divide by five to get an AVERAGE number of plants per grid segment. Record this number in the table. Multiple the average number of plants by 100 (this is the total number of grid segments) to find the total number of plants in the area based on your sample. Record this number in your data table

TABLE 1

Area A					
Name of Plant Species	Number of Each Species				
	Grid Segment:	Grid Segment:	Grid Segment:	Grid Segment:	Grid Segment:

Area A			
Plant Species	Total # of Species	Average # Per Grid	Estimate Number in Sample Area

TABLE 2

Area B					
Name of Plant Species	Number of Each Species				
	Grid Segment:	Grid Segment:	Grid Segment:	Grid Segment:	Grid Segment:

Area B			
Plant Species	Total # of Species	Average # Per Grid	Estimate Number in Sample Area

QUESTIONS

1. Compare the plant population of the two sample areas. Was one area more diverse than the other?

2. Why do biologists use Sampling? Why can't they just go into the forest and count all the sunflower plants?

3. Population Sampling is usually more effective when the population has an *even dispersion* pattern. *Clumped dispersion* patterns are the least effective. Explain why this would be the case.

4. Describe how you would use Sampling to determine the population of dandelions in your yard.

5. In a forest that measures 5 miles by 5 miles, a sample was taken to count the number of silver maple trees in the forest. The number of trees counted in the grid is shown below. The grids where the survey was taken were chosen randomly. Determine how many silver maple trees are in this forest using the random sampling technique. Show your work!

	7			
				3
			5	
11		9		